

TENSION MEMBER EXAMPLE
(GUTTS FROM BLOCK SHEAR)
BOLT HOLE BEARING: (EXAMPLE)

$$\phi R_n = \phi 1.2 l_c t F_u \leq 2.4 d t F_u$$

l_c = CLEAR DISTANCE \swarrow PL F_u

$$0.75 \times 1.2 \left(3 - \frac{(3/8 + 1/8)}{2} \right) (0.5) (65) (4)$$

LOWEST VALUE
(CONSERVATIVE) \nearrow

(4) BOLTS \nearrow

$$\phi R_n = 391^k \text{ TOTAL}$$

BOLTS SHEAR:

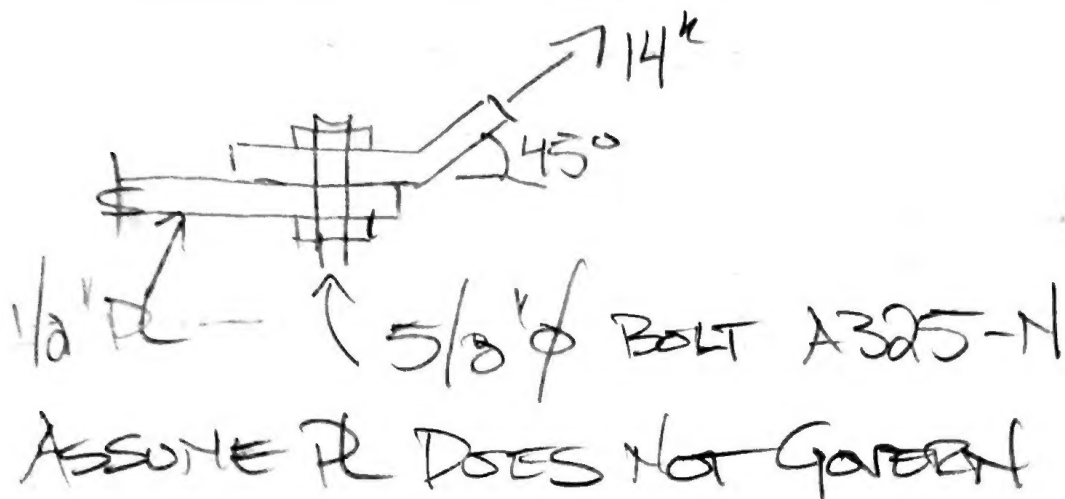
$$\phi P_n = \phi F_n A_b N_{\text{BOLT}}$$

$$= 0.75 (54 \text{ ksi}) (0.11 \text{ in}^2) (4) = \underline{\underline{17.8^k}}$$

\uparrow
TABLE 33.2
A325 SHEAR

CAPACITY LIMITED BY
BOLTS,

COMBINED TENSION / SHEAR:



SOLUTION

$$V_u = 14^k \times \cos 45^\circ = 10^k$$

$$T_u = 14^k \times \sin 45^\circ = 10^k$$

NEED TO SOLVE w/ F_{nt}'

$$F_{nt}' = 1.3 F_{nt} - \left(\frac{F_{nt}}{\phi F_{nv}} \right) f_{nv} \leq F_{nt}$$

$$F_{nt} = 90 \text{ ksi}$$

$$F_{nv} = 54 \text{ ksi}$$

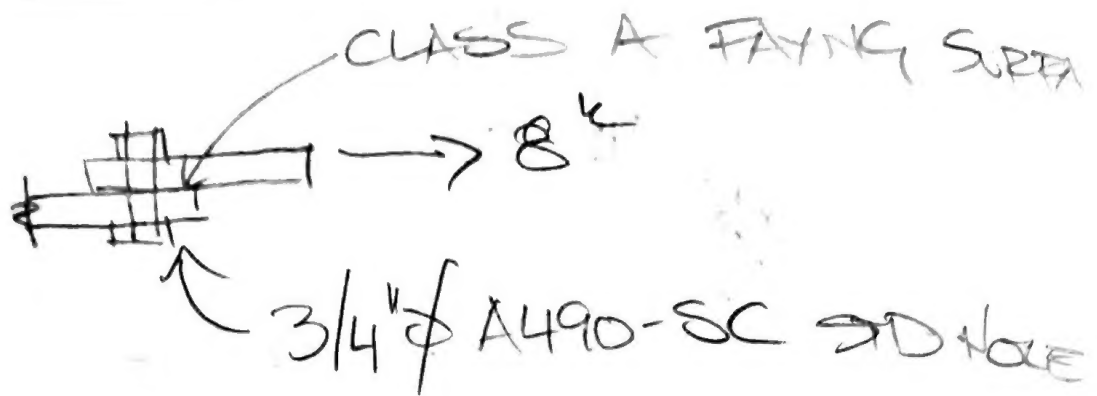
$$f_{nv} = 10^k / (0.307 \text{ in}^2) = 32.6 \text{ ksi}$$

$$F_{nt}' = 1.3 \times 90 - (90 / (0.75 \times 54)) \times 32.6 = 45 \text{ ksi}$$

$$\phi R_n = 0.75 F_{nt}' \times A_{\text{BOLT}} = 0.75 \times 45 \times 0.307 \text{ in}^2$$

$$\phi R_n = 10.4^k > 10^k = T_u \quad \text{ok} \checkmark$$

SLIP CRITICAL SHEAR ONLY



ASSUME ϕ DOES NOT GOVERN

SOLUTION:

$$\phi R_n = 1.0 \times \mu D_o h_f T_b n_s$$

\uparrow
STD HOLE

$$\mu = 0.3 \text{ (CLASS A)}$$

$$D_o = 1.3 \text{ (AVG BOLT PRETENSION FA)}$$

$$h_f = 1.0 \text{ (NO FILLERS)}$$

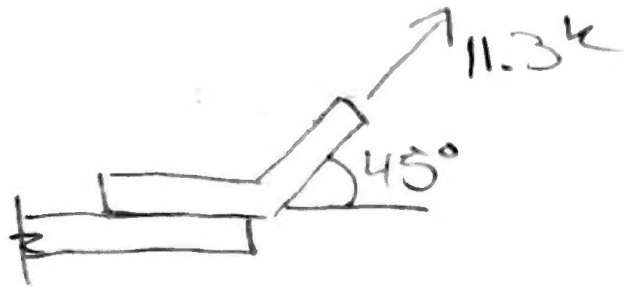
$$T_b = 35^k \text{ (TABLE J3.1)}$$

$$n_s = 1.0 \text{ (1 SLIP PLANE)}$$

$$\phi R_n = 1.0 \times 0.3 \times 1.3 \times 1.0 \times 35^k \times 1.0$$
$$= 11.8^k$$

$$R_u = 8^k \leq \phi R_n = 11.8^k \quad \text{OK} \checkmark$$

COMBINED TENSION/SHEAR ON SLIP CRITICAL BOLT



SAME INFO
AS PREVIOUS
PROBLEM.

$$V_u = 8^k$$
$$T_u = 8^k$$

MULTIPLY SLIP RESISTANCE
BY K_{sc}

$$K_{sc} = 1 - \left(\frac{T_u}{D_u T_b n_b} \right)$$

$$= 1 - \frac{8}{1.13 \times 35 \times 1.0} = 0.8$$

$$\phi R_n = 11.8^k \times 0.8 = 9.44^k$$

↑
FROM PREVIOUS

$$R_u = 8^k \text{ (SHEAR)} < \phi R_n = 9.44 \text{ ok} \checkmark$$